Statistics 310-002
Rice University

Spring 2015 Syllabus

Professor: Philip Ernst, Ph.D. (Assistant Professor of Statistics)

TAs Andrew Chapple, Ph.D. Candidate and Jonathan Stewart, Ph.D. Candidate

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Classes meet: ABL 123 TR 1–2:20pm

Course Objective

The goal of this course is to provide an undergraduate level introduction to both the theory and applications of probability and statistics. The class will also focus on a highly *intuitive* and conceptual understanding of these concepts. We will be first cover most of the material in chapters 1-4 of the Bertsekas textbook (roughly speaking: probabilistic modeling, basic combinatorics, conditional probability, Bayes theorem, independence, probability mass functions, probability density functions, discrete and continuous random variables, cumulative distribution functions, expectation, variance, joint distributions, covariance, the Central Limit Theorem, Poisson approximation to the binomial, hypothes). We will then proceed to cover most of the material in chapters 5-6 of Larsen and Marx (roughly, hypothesis testing, confidence intervals, the theory point estimation, estimators, and statistical sufficiency). The course will be replete with examples relating to game theory, sports, and current events.

Prerequisites

The only formal required prerequisities are MATH 101 and MATH 102. MATH 212 is encouraged, but is not essential. This being said, the key ingredient for success in this course is mathematical maturity and the willingness to think *hard*.

Course Materials

Required Textbook: *Introduction to Probability*, Bertsekas and Tsitsiklis, 2008 (Second Edition).

Optional Textbook: *Introduction to Mathematical Statistics and Its Applications*, Larsen and Marx, 2001 (Third Edition). This can be bought on Amazon for less than four dollars. However, I will provide the handouts from this book nonetheless.

Course Philosophy

The goal of this course is to introduce students to the inherent joys of probability and statistics. You are highly encouraged to come to office hours, both mine and those of the TAs, to talk about lectures, homework, or about any other aspect of the course. There are *no stupid questions*. We *deeply* care that all of you succeed in this class and that this spring is an enjoyable and memorable experience for all.

Course Focus

Each rendition of STAT 310 emphasizes slightly different material. In the Spring 2015 semester, STAT 310-001 and STAT 310-002 will not be taught by the same Professor, and thus they will have different exams and homeworks. In STAT 310-002, I will be emphasizing both the theory and applications of probability for approximately 2/3 of the course. The remainder of the course will be devoted to the theory of statistics and its applications. Although I will occasionally use datasets during class, data analytics will not be emphasized. Those looking for a data analytic approach should consider STAT 385 (Methods for Data Analysis) and/or STAT 405 (Statistical Computing and Graphics). Those looking for a more gentle introduction to probability and statistics should consider STAT 280. Finally, those who wish to take a more rigorous probability course based on the mathematical foundations of real analysis should consider STAT 581. I mention this in advance because I want to make sure you pick a course best suited to your interests and goals.

How Do I Succeed in STAT 310-002?

This course rewards students who are willing to think hard. Probability and statistics can often be counterintuitive, and the students who get the most out of the course are those who are willing to get their hands dirty and problem solve. Allocating sufficient time to work on problem sets, as well as discussing concepts with your classmates, TAs, and professors, are key to your success. You are also encouraged to come to the PROBLEM SOLVING SESSIONS!

The Problem Solving Sessions

Each week, on either a Thursday or Friday (TBA), a TA will lead a problem solving session on the week's material. These sessions are really important to your consistent engagement with the material.

Homework

There will be seven homework assignments. Homeworks will be assigned on OWL-SPACE and will usually be due a week later in class. Homework will be graded out of 50 points. Each homework must be neat and stapled. *No late homework will be accepted.* The reason for this policy is that I want to post the solutions immediately after the due date. Graded homework will be returned in class. Scores for homeworks are finalized one week after the graded copies are handed back. Thereafter there will be no changes and no re-grading. Do not delay checking your graded homeworks to the end of the semester. You will be allowed to drop the lowest of your seven homework scores.

Homework is the *most* important part of this course. To succeed in this class, one must *individually* do *a lot* of practice questions and think deeply about the concepts. Simply put, "Probability is not a spectator sport!"

You are encouraged to work together on homework and to consult me with any questions but you *must* submit your own solutions, with your own write-up and in your own words. There can be no collaboration on the actual *writing*. Failure to comply will result in severe penalties.

Examinations

- There will be two midterm examinations, dates TBA.
- There will be one final examination, date TBA.

Attendance

Not enforced, but highly recommended. Active attendance is absolutely critical to learning the material. Since the course is capped at forty-nine students, I will have a good sense by the end of the semester of who is coming to class regularly and who is not. I reserve the right to reward students in the former group whose final grades are "borderline" by giving the student the higher of the two grades.

Grading and Grading Policy

Your course grade will be calculated as follows:

- Homework: 25% (Your lowest homework score is dropped from this calculation)
- Midterm 1: 20 %
- Midterm 2: 20%
- Final: 35 %

Classroom Etiquette

I kindly ask that you do not engage in any behavior that may interfere with the learning of other students. During lectures and examinations, all laptops, cell phones, and other electronic devices must be put away.

Rice Honor Code

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook/. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

Disability Support Services

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Syllabus Change Policy

This syllabus is only a guide for the course and is subject to change with advanced notice.